example, sprayed onto the submount 5670 for active cooling, a micro-fan or other thermal facility.

Referring to Fig. 83, in embodiments the LED packages, such as those disclosed in Figs. 56 through 100, may be provided in conjunction with one or more other electrical components 8358, such as external electrical components that can improve the performance of the LED package 5650. Electrical components 8358 may include a capacitor, a resistor, a diode, an inductor, or the like.

Referring to Fig. 84, in embodiments a capacitor 8458 is supplied for external energy storage. Such a capacitor 8458 may be useful for a dimmer-compatible circuit, a timing circuit, or other circuit as described in the embodiments of Figs. 56 through 100.

Referring to Fig. 85, in embodiments a resistor 8558 may be used with the LED packages 5654 described in connection with Figs. 56 through to set a voltage level of the input signal to the LED package 5650.

Referring to Fig. 86, in embodiments the external component may be an inductor 8658 to provide an inductive input to the LED package 5650. In embodiments the inductor 8658 may comprise the reflector for the LED package 5650.

Referring to Fig. 87, the submount 5670 may include a component 8754 that provides an output signal 8752. Thus, the LED packages 5654 of Figs. 56 through 100 may be provided with input/output facilities to provide signals and data to other LED packages 5654 or to any other devices.

Referring to Fig. 88, the electronic component in the submount 5670 may be a buck converter 8852, down converter, or the like.

Referring to Fig. 89, in embodiments the electronic component in the submount 5670 may be a flyback converter 8952.

Referring to Fig. 90, in embodiments the electronic component in the submount 5670 may be a current regulator 9052.

Referring to Fig. 91, in embodiments the LED package 5650 may include a micro-electromechanical system ("MEMS") device 9152 in the submount 5670. Thus, the LED packages 5654 of this disclosure may include integrated MEMS devices, such as micro-machines, micro-fans, pressure transducers, temperature sensors, oscillators, accelerometers, and other MEMS devices.

Referring to Fig. 92, a MEMS active cooling element 9252 may be incorporated into the submount 5670, such as to serve as a thermal facility 2500 for cooling the LED package 5650.

Referring to Fig. 93, in embodiments the MEMS element that is incorporated in the submount 5670 may be a pressure transducer 9352.

Referring to Fig. 94, in embodiments the electronic component integrated in the submount 5670 may be a chemical detector, such as a MEMS device for chemical detection. In such embodiments the LED packages 5654 may be used to indicate a sensed chemical condition, such as to provide a warning as to the presence of a pollutant or toxic chemical.

Referring to Fig. 95, in embodiments the electronic component integrated in the submount 5670 may be a gyro, such as a MEMS based gyro, for providing a gyro-based signal, such as to measure acceleration, to provide a reference as to a direction, such as for navigation applications, or the like.

Referring to Fig. 96, in embodiments the electronic component integrated with the submount 5670 may be an accelerometer 9652, so that an LED package 5650 may

respond to acceleration, such as to provide a warning light, alert, or other signal upon acceleration.

Referring to Fig. 97, in embodiments the submount 5670 may include an oscillator 9752, such as for providing a timing reference signal for the LED package 5650.

Referring to Fig. 98, in embodiments the submount 5670 may include a Peltier effect device 9852, or a similar component for removing heat from the submount 5670 or the LED die(s). In generally, a Peltier device is understood to refer to a semiconductor-based cool or heating device that can product temperature differentials between two surfaces in response to an applied current. A Peltier module may include successively mounted semiconductors where successive p-n and n-p junctions has a thermal contact with radiators. Under applied current one of the radiators heats while the other cools. A conventional Peltier module may provide temperature differentials of several tens of degrees Celsius. Greater temperature differentials can be achieved by cascading modules. By cooling the hot radiator, it is also possible to drive the cool radiator of a single Peltier module below freezing.

While Peltier modules are one solid state technique for temperature control, it will be appreciated that other techniques are known and may be usefully employed with the systems described herein. For example, an active cooling system may use an electrokinetic pump with no moving parts to move a cooling fluid through microchannels etched into a semiconductor material. A sealed cooling loop may be formed, with microchannel heat collectors is attached to packaged semiconductor to absorb heat generated by hot spots. The heat may then travel short distances to a fluid flowing through channels in the collectors which may be 20 to 100 microns wide each. Thus heat may be transported away from a chip to a radiator where the heat is exhausted to the outside air. The fluid may then travel through a solid-state pump to complete the cooling loop. One such system is commercially available from Cooligy, Inc., and described in U.S. Pat. No. 6,678,168, the teachings of which are incorporated herein by reference.

The LED packages 5650 of Figs. 56 et seq. may be fabricated from a variety of materials. In embodiments the submount 5670 and/or the LED die(s) 5654 may be fabricated from a relatively heat-tolerant semiconductor material. In one preferred embodiment the material may be silicon carbide.

In embodiments the LED packages 5650 may be compression molded or injection molded and may include plastic, metal, ceramic, epoxy, glass, polymer, and compound materials.

In embodiments the LED packages 5650 can be used in a variety of illumination, indication and display applications, product and environments as described herein and in the documents incorporated by reference herein.

Referring to Fig. 99, in embodiments an LED package 5650 such as described throughout this disclosure may be incorporated in a cellular phone system 9960. A component 9952 may be incorporated in the submount 5670 that is compatible with the power system of the cell phone system 9960, such as to take power directly from the electrical system 9958, such as a bus, of the cellular phone system 9960. In embodiments, a similar device could be a PDA, notebook computer, or any other kind of mobile or portable device. Thus, disclosed herein is an LED package with a circuit built into the submount 5670 for receiving power directly from the electrical system of a cell phone or other portable device.

Referring to Fig. 100, in embodiments an LED package 5650 may be incorporated into or on an automobile and connected to the electrical and/or computer system 10060 of the automobile. The submount 5670 may include a component 10052 designed to accommodate the electrical voltage and other characteristics of the automobile's electrical system, such as taking power from a bus 10058 without requiring a separate wire. Thus, disclosed herein is an LED package with a circuit built into the

submount 5670 for receiving power directly from the electrical system of an automobile or other vehicle.

In embodiments an LED package 5650 may be equipped with a circuit for accepting a low-voltage input, such as an input from a battery, such as a one and one-half volt battery.

In other embodiments, the LED packages 5650 may be used in a wide variety of devices, products, applications, environments and systems, such as casino gaming devices, personal computers, computer gaming devices, entertainment devices, elevators, automation systems, such as for factories, traffic signals, photographic flashes and the like.

Referring to Fig. 101, in embodiments an LED package 5650 may be included in a road barrier 10102, such as to light the roadway or to provide a warning signal that a vehicle is approaching the barrier. The barrier might include an energy source, such as a photovoltaic source.

While the invention has been described in connection with certain preferred embodiments, other embodiments will be recognized by those of ordinary skill in the art and are encompassed herein.

CLAIMS

1. A light source, comprising:

at least one LED die including an LED, and

a package for the LED die, the package including a submount, wherein the submount incorporates an electronic component for controlling the LED, wherein the electronic component facilitates control of at least one of the intensity and the apparent intensity of the LED die.

2. The light source of claim 1 wherein the LED package includes components selected from the group consisting of an optical facility, a lens, an LED die mounted in a reflector cup, a silicone filling, a wire bond between the LED and the edge of the reflector cup, a submount, a diode in the submount, and a plurality of isolated leads for electrically connecting the LED die to a power source.

3. The light source of claim 1 wherein the LED package includes an LED die mounted in a reflector cup and surrounded by an injection molding.

4. The light source of claim 1 wherein the LED package includes an LED die and submount mounted in a reflector cup and surrounded by a plastic package.

5. The light source of claim 1 wherein the LED package is created by a mask.

6. The light source of claim 1 wherein the LED package has a substrate, wherein the substrate is selected from the group consisting of a metal core substrate, a ceramic substrate, a ceramic on metal substrate, an FR4 substrate, a sapphire substrate, an silicon on sapphire substrate, and a silicon carbide substrate.

7. The light source of claim 1 wherein at one of the levels of intensity the LED die is in an off condition.

8. The light source of claim 1 wherein the package includes a reflector.

9. The light source of claim 1 wherein the package includes an electro-static discharge protection diode.

10. The light source of claim 1 wherein the electronic component is mounted on one or more submounts of the package.

11. The light source of claim 1 wherein the electronic component includes a current regulator for allowing the module to take a DC signal of between .5V and 100V DC signal.

12. The light source of claim 1 wherein the electronic component includes a circuit for taking a 12V AC signal directly.

13. The light source of claim 12 wherein the electronic component includes at least one of a bridge rectifier, a capacitor, and a current regulator.

14. The light source of claim 1 wherein the LED package includes an optical facility.

15. The light source of claim 1 wherein the electronic component includes a circuit for taking an AC signal with voltage in a range from 90V to 240V.

16. The light source of claim 15 wherein the electronic component includes a switch mode power supply and a current regulator.

17. The light source of claim 1 wherein the electronic component includes a circuit.

18. The light source of claim 1 wherein the electronic component includes a dimming circuit.

19. The light source of claim 1 wherein the electronic component is responsive to power-cycle events.

20. The light source of claim 1 wherein the electronic component includes a data interface.

21. The light source of claim 1 wherein the data interface is configured to receive a signal selected from the group consisting of a DMX signal, a DALI signal, an Ethernet signal, a TCP/IP protocol signal, an HTTP protocol signal, an XML or other mark-up language instruction, a script, an 802.11 or other wireless signal, a cellular or radio-frequency signal, an infrared signal, or a Bluetooth signal.

22. The light source of claim 1 wherein the electronic component includes firmware.

23. The light source of claim 22 wherein the firmware includes an XML parser.

24. The light source of claim 22 wherein the firmware includes firmware for responding to a signal selected from the group consisting of a DMX signal, a DALI signal, an Ethernet signal, a TCP/IP protocol signal, an HTTP protocol signal, an 802.11 signal, a cellular telephony signal, a radio-frequency signal, an infrared signal, or a Bluetooth signal.

25. The light source of claim 1 wherein the electronic component includes an application specific integrated circuit.

26. The light source of claim 25 wherein the application specific integrated circuit responds to signals according to a data protocol.

27. The light source of claim 1 wherein the protocol is a serial addressing protocol.

28. The light source of claim 27 wherein the electronic component is a processor.

29. The light source of claim 27 wherein the processor controls a signal by at least one of pulse-width modulation and pulse-amplitude-modulation.

30. The light source of claim 27 wherein the processor selects between a pulse-width-modulation mode and a pulse-amplitude-modulation mode.

31. The light source of claim 27 wherein the processor provides calibration for the light source.

32. The light source of claim 27 wherein the processor responds to a sensor.

33. The light source of claim 27 wherein the processor responds to a sensor in a sensor-feedback loop.

34. The light source of claim 1 wherein the electronic component includes a voltage regulator.

35. The light source of claim 1 wherein the electronic component includes a power-factor-control circuit.

36. The light source of claim 1 wherein the electronic component includes an inductive loop drive circuit.

37. The light source of claim 1 wherein the electronic component includes a feed-forward drive circuit.

38. The light source of claim 1 wherein the electronic component responds to a combined power/data signal.

39. The light source of claim 1 wherein the electronic component provides an address for the light source.

40. The light source of claim 1 wherein the electronic component includes a signal source for a signal including at least one of a DMX signal, a DALI signal, an Ethernet signal, a TCP/IP protocol signal, an HTTP protocol signal, an 802.11 signal, a cellular telephony signal, a radio-frequency signal, an infrared signal, or a Bluetooth signal.

41. The light source of claim 1 wherein the electronic component includes a temperature sensor.

42. The light source of claim 1 wherein the electronic component includes a timing facility.

43. The light source of claim 1 wherein the electronic component includes a drive circuit adapted to receive an arbitrary voltage.

44. The light source of claim 43 wherein the electronic component includes a microcontroller.

45. The light source of claim 1 wherein the electronic component includes a drive circuit adapted to receive high voltage.

46. The light source of claim 45 wherein the drive circuit includes a power-factor-corrected drive circuit.

47. The light source of claim 1 wherein the electronic component includes a data storage facility.

48. The light source of claim 47 wherein the data storage facility includes memory.

49. The light source of claim 47 wherein the data storage facility includes a lookup table for storing values for a control signal for the LED.

50. The light source of claim 47 wherein the data storage facility stores programs for controlling the light source.

51. The light source of claim 47 wherein the data storage facility stores programs for responding to control signals from a signal source.

52. The light source of claim 47 wherein the data storage facility stores a program for controlling power to the LED die based on the anticipated requirements of the installation of the light source.

53. The light source of claim 47 wherein the data storage facility includes an erasable programmable read-only memory.

54. The light source of claim 1 wherein the electronic component includes a photosensor.

55. The light source of claim 1 wherein the electronic component includes a digital-to-analog converter.

56. The light source of claim 1 wherein the electronic component includes an analog-to-digital converter.

57. The light source of claim 1 wherein the electronic component includes a power facility.

58. The light source of claim 1 wherein the electronic component includes a wireless control facility.

59. The light source of claim 1 wherein the electronic component includes a bridge rectifier.

60. The light source of claim 1 wherein the electronic component includes a boost converter.

61. The light source of claim 1 wherein the electronic component includes a boost regulator.

62. The light source of claim 1 wherein the component includes an analog dimming input.

63. The light source of claim 1 wherein the electronic component includes a resistor for assisting in identification of the light source.

64. The light source of claim 1 wherein the electronic component includes a temperature sensor and a facility for controlling the LED in response to a thermal condition.

65. The light source of claim 1 further comprising a facility for connecting the light source to a conductive element.

66. The light source of claim 65 wherein the conductive element includes a linear conductive element.

67. The light source of claim 65 wherein the conductive element includes a rail.

68. The light source of claim 1 wherein the light source is for a boat light.

69. The light source of claim 1 wherein the light source is for an MR-type fixture.

70. The light source of claim 1 wherein the light source is for a reading light.

71. The light source of claim 70 wherein the LED die includes a high-power LED die.

72. The light source of claim 71 wherein the LED die includes a 5W or greater LED die.

73. The light source of claim 1 wherein the light source is for a camera flash.

74. The light source of claim 1 further comprising an external resistor for adjusting a voltage input to the light source.

75. The light source of claim 1 further comprising an optical facility including at least one of a lens, a filter, a diffuser, a reflector, a phosphorescent material, or a luminescent material.

76. The light source of claim 1 further comprising an optical facility including at least one of a Bragg cell, a holographic film, a digital mirror, a spinning mirror, a light pipe, a color mixing system, or a microlens array.

77. A method for providing a light source comprising:

providing at least one LED in an LED die, and

packaging the LED die with a submount, wherein the submount incorporates an electronic component for controlling the LED, wherein the electronic component facilitates control of at least one of the intensity and the apparent intensity of the LED die.

78. The method of claim 77 wherein the LED package includes components selected from the group consisting of a an optical facility, a lens, an LED die mounted in a reflector cup, a silicone filling, a wire bond between the LED and the edge of the

reflector cup, a submount, a diode in the submount, and a plurality of isolated leads for electrically connecting the LED die to a power source.

79. The method of claim 77 wherein the LED package includes an LED die mounted in a reflector cup and surrounded by an injection molding.

80. The method of claim 77 wherein the LED package includes an LED die and submount mounted in a reflector cup and surrounded by a plastic package.

81. The method of claim 77 wherein the LED package is created by a mask.

82. The method of claim 77 wherein the LED package has a substrate, wherein the substrate is selected from the group consisting of a metal core substrate, a ceramic substrate, a ceramic on metal substrate, an FR4 substrate, a sapphire substrate, an silicon on sapphire substrate, and a silicon carbide substrate.

83. The method of claim 77 wherein at one of the levels of intensity the LED die is in an off condition.

84. The method of claim 77 wherein the package includes a reflector.

85. The method of claim 77 wherein the package includes an electro-static discharge protection diode.

86. The method of claim 77 wherein the electronic component is mounted on one or more submounts of the package.

87. The method of claim 77 wherein the electronic component includes a current regulator for allowing the module to take a DC signal of between .5V and 100V.

88. The method of claim 77 wherein the electronic component includes a circuit for taking a 12V AC signal directly.

89. The method of claim 88 wherein the electronic component includes at least one of a bridge rectifier, a capacitor, and a current regulator.

90. The method of claim 77 wherein the LED package includes an optical facility.

91. The method of claim 77 wherein the electronic component includes a circuit for taking an AC signal with voltage in a range from 90V to 240V.

92. The method of claim 91 wherein the electronic component includes a switch mode power supply and a current regulator.

93. The method of claim 77 wherein the electronic component includes a circuit.

94. The method of claim 77 wherein the electronic component includes a dimming circuit.

95. The method of claim 77 wherein the electronic component is responsive to power-cycle events.

96. The method of claim 77 wherein the electronic component includes a data interface.

97. The method of claim 77 wherein the data interface is configured to receive a signal selected from the group consisting of a DMX signal, a DALI signal, an Ethernet signal, a TCP/IP protocol signal, an HTTP protocol signal, an XML or other mark-up language instruction, a script, an 802.11 or other wireless signal, a cellular or radio-frequency signal, an infrared signal, or a Bluetooth signal.

98. The method of claim 77 wherein the electronic component includes firmware.

99. The method of claim 98 wherein the firmware includes an XML parser.

100. The method of claim 98 wherein the firmware includes firmware for responding to a signal selected from the group consisting of a DMX signal, a DALI signal, an Ethernet signal, a TCP/IP protocol signal, an HTTP protocol signal, an 802.11 signal, a cellular telephony signal, a radio-frequency signal, an infrared signal, or a Bluetooth signal.

101. The method of claim 77 wherein the electronic component includes an application specific integrated circuit.

102. The method of claim 101 wherein the application specific integrated circuit responds to signals according to a data protocol.

103. The method of claim 77 wherein the protocol is a serial addressing protocol.

104. The method of claim 103 wherein the electronic component includes a processor.

105. The method of claim 103 wherein the processor controls a signal by at least one of pulse-width-modulation and pulse-amplitude-modulation.

106. The method of claim 103 wherein the processor selects between a pulse-width-modulation mode and a pulse-amplitude-modulation mode.

107. The method of claim 103 wherein the processor provides calibration for the light source.

108. The method of claim 103 wherein the processor responds to a sensor.

109. The method of claim 103 wherein the processor responds to a sensor in a sensor-feedback loop.

110. The method of claim 77 wherein the electronic component includes a voltage regulator.

111. The method of claim 77 wherein the electronic component includes a power-factor-control circuit.

112. The method of claim 77 wherein the electronic component includes an inductive loop drive circuit.

113. The method of claim 77 wherein the electronic component includes a feed-forward drive circuit.

114. The method of claim 77 wherein the electronic component responds to a combined power/data signal.

115. The method of claim 77 wherein the electronic component provides an address for the light source.

116. The method of claim 77 wherein the electronic component includes a signal source for a signal including at least one of a DMX signal, a DALI signal, an Ethernet signal, a TCP/IP protocol signal, an HTTP protocol signal, an 802.11 signal, a cellular telephony signal, a radio-frequency signal, an infrared signal, or a Bluetooth signal.

117. The method of claim 77 wherein the electronic component includes a temperature sensor.

118. The method of claim 77 wherein the electronic component includes a timing facility.

119. The method of claim 77 wherein the electronic component includes a drive circuit adapted to receive an arbitrary voltage.

120. The method of claim 119 wherein the electronic component includes a microcontroller.

121. The method of claim 77 wherein the electronic component includes a drive circuit adapted to receive high voltage.

122. The method of claim 121 wherein the drive circuit includes a power-factor-corrected drive circuit.

123. The method of claim 77 wherein the electronic component includes a data storage facility.

124. The method of claim 123 wherein the data storage facility includes memory.

125. The method of claim 123 wherein the data storage facility includes a lookup table for storing values for a control signal for the LED.

126. The method of claim 123 wherein the data storage facility stores programs for controlling the light source.

127. The method of claim 123 wherein the data storage facility stores programs for responding to control signals from a signal source.

128. The method of claim 123 wherein the data storage facility stores a program for controlling power to the LED die based on the anticipated requirements of the installation of the light source.

129. The method of claim 123 wherein the data storage facility includes an erasable programmable read-only memory.

130. The method of claim 77 wherein the electronic component includes a photosensor.

131. The method of claim 77 wherein the electronic component includes a digital-to-analog converter.

132. The method of claim 77 wherein the electronic component includes an analog-to-digital converter.

133. The method of claim 77 wherein the electronic component includes a power facility.

134. The method of claim 77 wherein the electronic component includes a wireless control facility.

135. The method of claim 77 wherein the electronic component includes a bridge rectifier.

136. The method of claim 77 wherein the electronic component includes a boost converter.

137. The method of claim 77 wherein the electronic component includes a boost regulator.

138. The method of claim 77 wherein the component includes an analog dimming input.

139. The method of claim 77 wherein the electronic component includes a resistor for assisting in identification of the light source.

140. The method of claim 77 wherein the electronic component includes a temperature sensor and a facility for controlling the LED in response to a thermal condition.

141. The method of claim 77 further comprising a facility for connecting the light source to a conductive element.

142. The method of claim 141 wherein the conductive element includes a linear conductive element.

143. The method of claim 141 wherein the conductive element includes a rail.

144. The method of claim 77 wherein the light source is for a boat light.

145. The method of claim 77 wherein the light source is for an MR-type fixture.

146. The method of claim 77 wherein the light source is for a reading light.

147. The method of claim 146 wherein the LED die includes a high-power LED die.

148. The method of claim 147 wherein the LED die includes a 5W or greater LED die.

149. The method of claim 77 wherein the light source is for a camera flash.

150. The method of claim 77 further comprising an external resistor for adjusting a voltage input to the light source.

151. The method of claim 77 further comprising an optical facility including at least one of a lens, a filter, a diffuser, a reflector, a phosphorescent material, or a luminescent material.

152. The method of claim 77 further comprising an optical facility including at least one of a Bragg cell, a holographic film, a digital mirror, a spinning mirror, a light pipe, a color mixing system, or a microlens array.

153. A lighting system comprising:

a plurality of light sources including at least one LED in an LED die, the LED die packaged with a submount, wherein the submount incorporates an electronic component for controlling the LED, wherein the electronic component facilitates control of at least one of the intensity and the apparent intensity of the LED die.

154. A light source, comprising:

at least one LED die including an LED, and

a package for the LED die, the LED package including a submount, wherein the submount incorporates an electronic component for controlling the LED, wherein the electronic component facilitates control of at least one of the intensity and the apparent intensity of the LED die.

155. The light source of claim 154 wherein the LED package includes a thermal facility for cooling at least one of the LED die and the submount.

156. The light source of claim 154 wherein the thermal facility is selected from the group consisting of a Peltier effect device, a fluid cooling facility, a potting facility, a thermally conductive plate, a gap pad, a micro-machine, a MEMs device, and a fan.

157. The light source of claim 154 further comprising an external electrical component for the package, wherein the external component is selected from the group consisting of a capacitor, a resistor, and an inductor.

158. The light source of claim 157 wherein the external component is a capacitor for energy storage and wherein the submount includes a dimmer-compatible circuit.

159. The light source of claim 157 wherein the external component is a resistor to set a voltage level of the input signal to the LED package.

160. The light source of claim 157 wherein the external component is a capacitor for bulk energy storage.

161. The light source of claim 157 wherein the external component is an inductor.

162. The light source of claim 154 further comprising a reflective cup, the reflective cup serving as an inductor for the LED package.

163. The light source of claim 154 wherein at least one of the submount and the LED is fabricated from a heat-tolerant material.

164. The light source of claim 163 wherein the heat-tolerant material is silicon carbide.

165. The light source of claim 154 further comprising a memory facility, wherein the memory facility includes an SRAM.

166. The light source of claim 154 wherein the electronic component is a buck converter.

167. The light source of claim 154 wherein the electronic component is a flyback converter.

168. The light source of claim 154 wherein the LED package is compression molded.

169. The light source of claim 154 wherein the LED package is plastic molded.

170. The light source of claim 154 wherein the LED package includes a material selected from the group consisting of a metal, a ceramic, an epoxy, a plastic, a glass, a polymer, and a compound.

171. The light source of claim 154 wherein the electronic component is a current regulator.

172. The light source of claim 154 wherein the LED package is used as an indicator.

173. The light source of claim 172 wherein the indicator indicates a sensed condition.

174. The light source of claim 173 wherein the condition is at least one of acceleration, pressure, temperature, time, humidity, light, a fault condition, proximity, and a chemical condition.

175. The light source of claim 172 wherein the indicator displays a state of a device.

176. The light source of claim 172 wherein the indicator displays a state of a sensor.

177. The light source of claim 154 wherein the electronic component includes a MEMS device.

178. The light source of claim 177 wherein the MEMS device includes a pressure transducer.

179. The light source of claim 177 wherein the MEMS device includes an active cooling device.

180. The light source of claim 177 wherein the MEMS device includes a chemical detector.

181. The light source of claim 177 wherein the MEMS device includes a gyro.

182. The light source of claim 177 wherein the MEMS device includes an accelerometer.

183. The light source of claim 177 wherein the MEMS device includes a timer.

184. The light source of claim 177 wherein the MEMS device includes an oscillator.

185. The light source of claim 154 wherein the electronic component includes a Peltier effect device.

186. The light source of claim 154 wherein the LED package is used as a component for a display.

187. The light source of claim 186 wherein the display includes one or more of a graphics display, a monitor, a video display, and an animation display.

188. The light source of claim 154 wherein the LED package has an input/output facility.

189. The light source of claim of 154 wherein the LED package is used in a road barrier.

190. The light source of claim 154 further comprising a photovoltaic energy source.

191. The light source of claim 154 wherein the LED package is used in a cellular phone.

192. The light source of claim 191 wherein the LED package operates directly from the power source for the cell phone.

193. The light source of claim 154 wherein the LED package is used in automobile.

194. The light source of claim 193 wherein the LED package operates directly on an electrical bus for the automobile.

195. The light source of claim 154 wherein the LED package operates on power from a battery.

196. The light source of claim 195 wherein the battery is a 1.5 Volt battery.

197. The light source of claim 154 wherein the LED package is used in connection with a gaming device.

198. The light source of claim 154 wherein the LED package is used in connection with an elevator.

199. The light source of claim 154 wherein the LED package is used in connection with an automation system for a factory.

200. The light source of claim 154 wherein the LED package is used in connection with a traffic signal.

201. The light source of claim 154 wherein the LED package is used in a photographic flash.

ABSTRACT

Methods and systems are provided for LED modules that include an LED die integrated in an LED package with a submount that includes an electronic component for controlling the light emitted by the LED die. The electronic component integrated in the submount may include drive hardware, a network interface, memory, a processor, a switch-mode power supply, a power facility, or another type of electronic component.

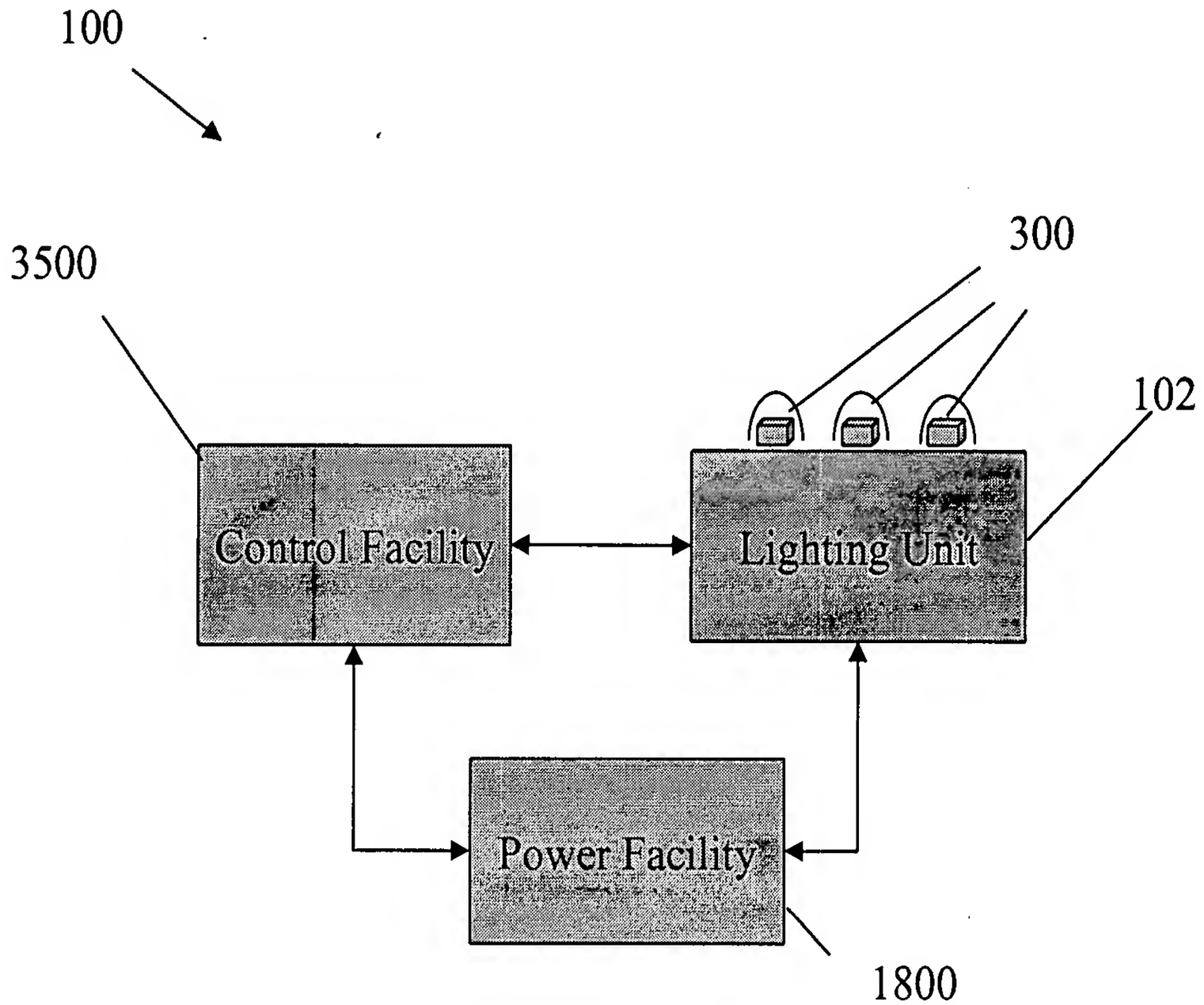

100
3500
300
102
Control Facility
Lighting Unit
Power Facility
1800

Fig. 1

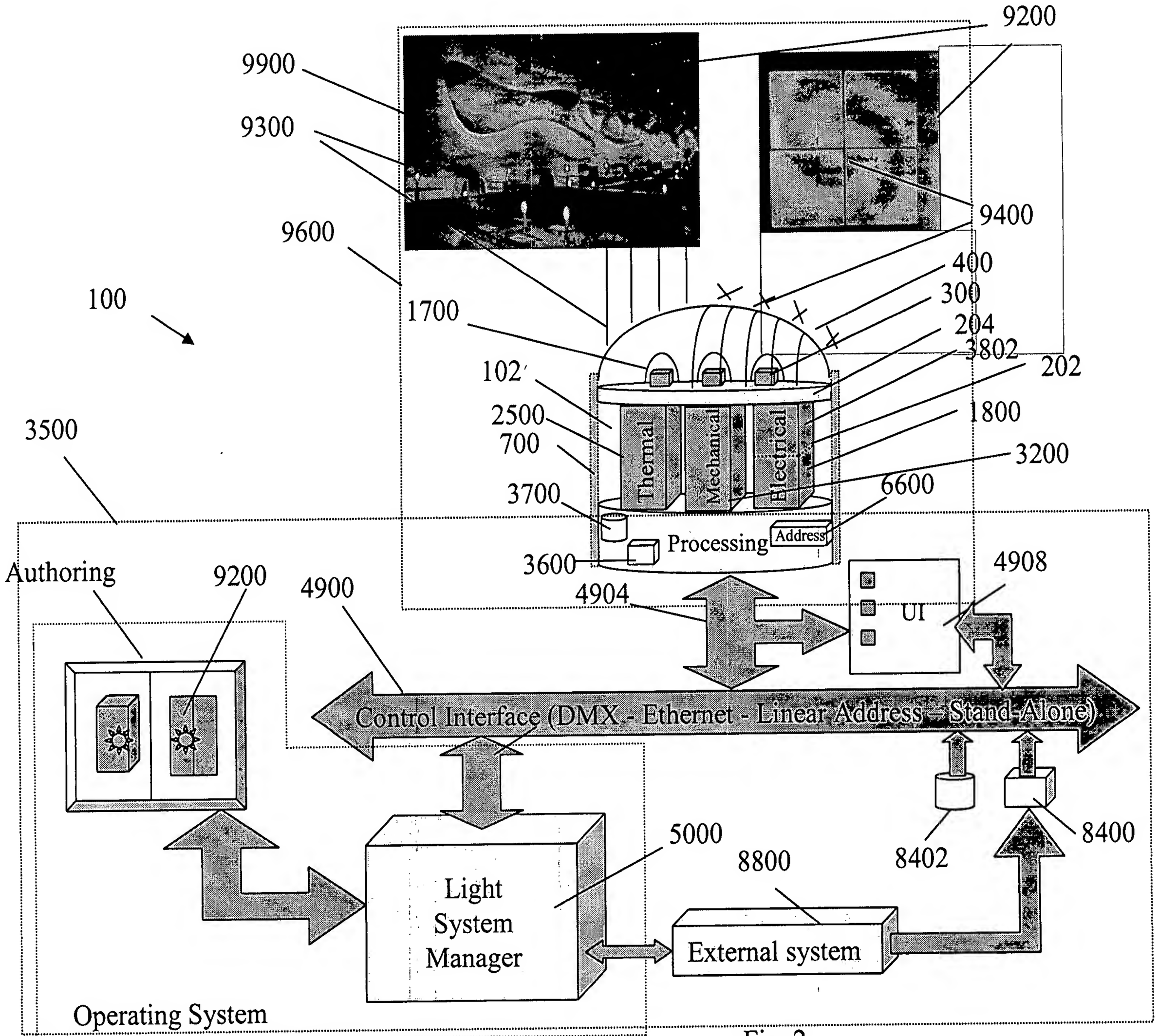

9200
9900
9300
9400
9600
100
400
300
1700
204
3802
202
102
2500
1800
700
3200
3500
3700
6600
Thermal
Mechanical
Electrical
Processing
Address
3600
Authoring
9200
4900
4904
4908
UI
Control Interface (DMX - Ethernet - Linear Address – Stand-Alone)
8400
8402
5000
8800
Light
System
Manager
External system
Operating System

Fig. 2

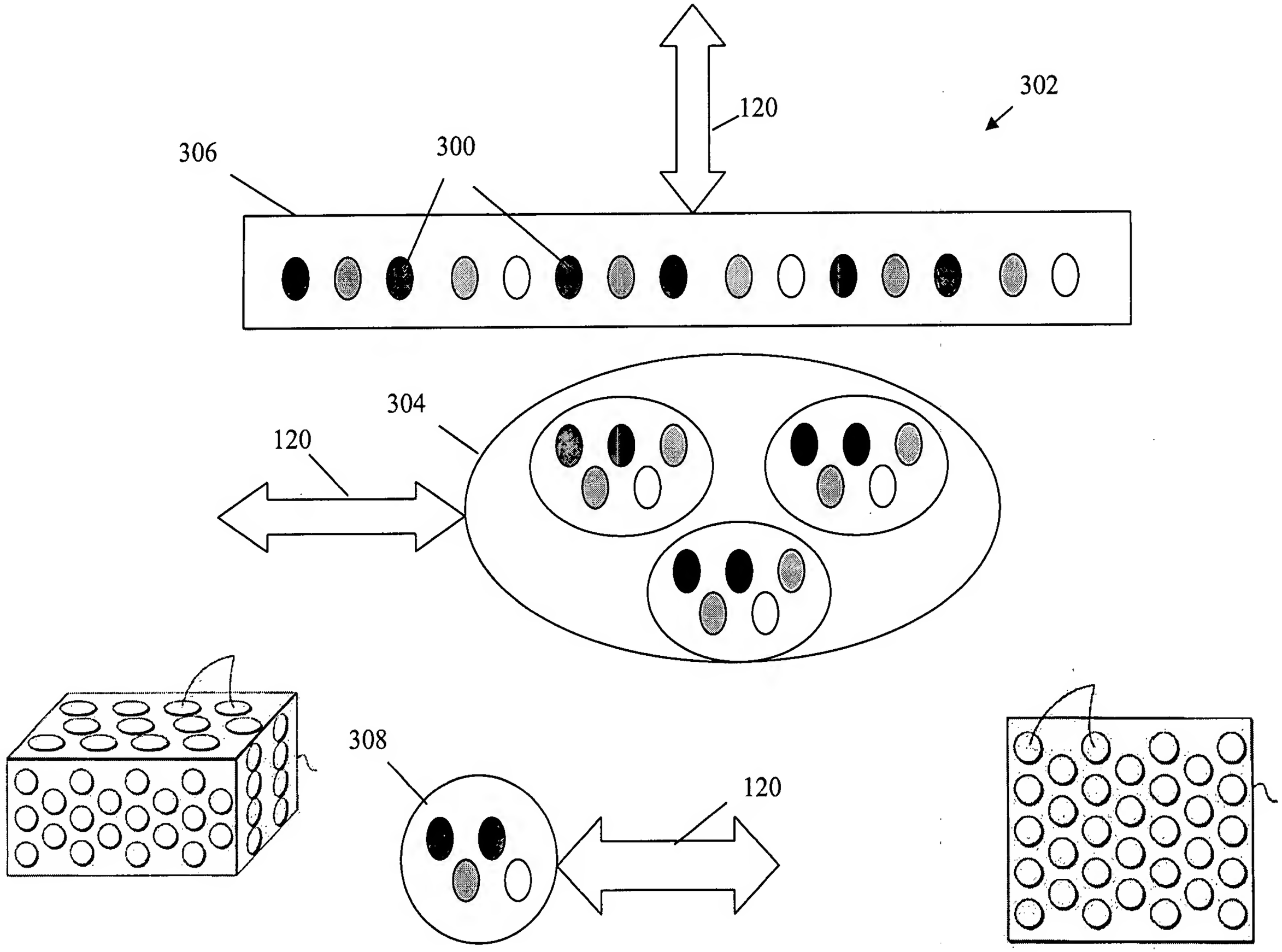


Fig. 3

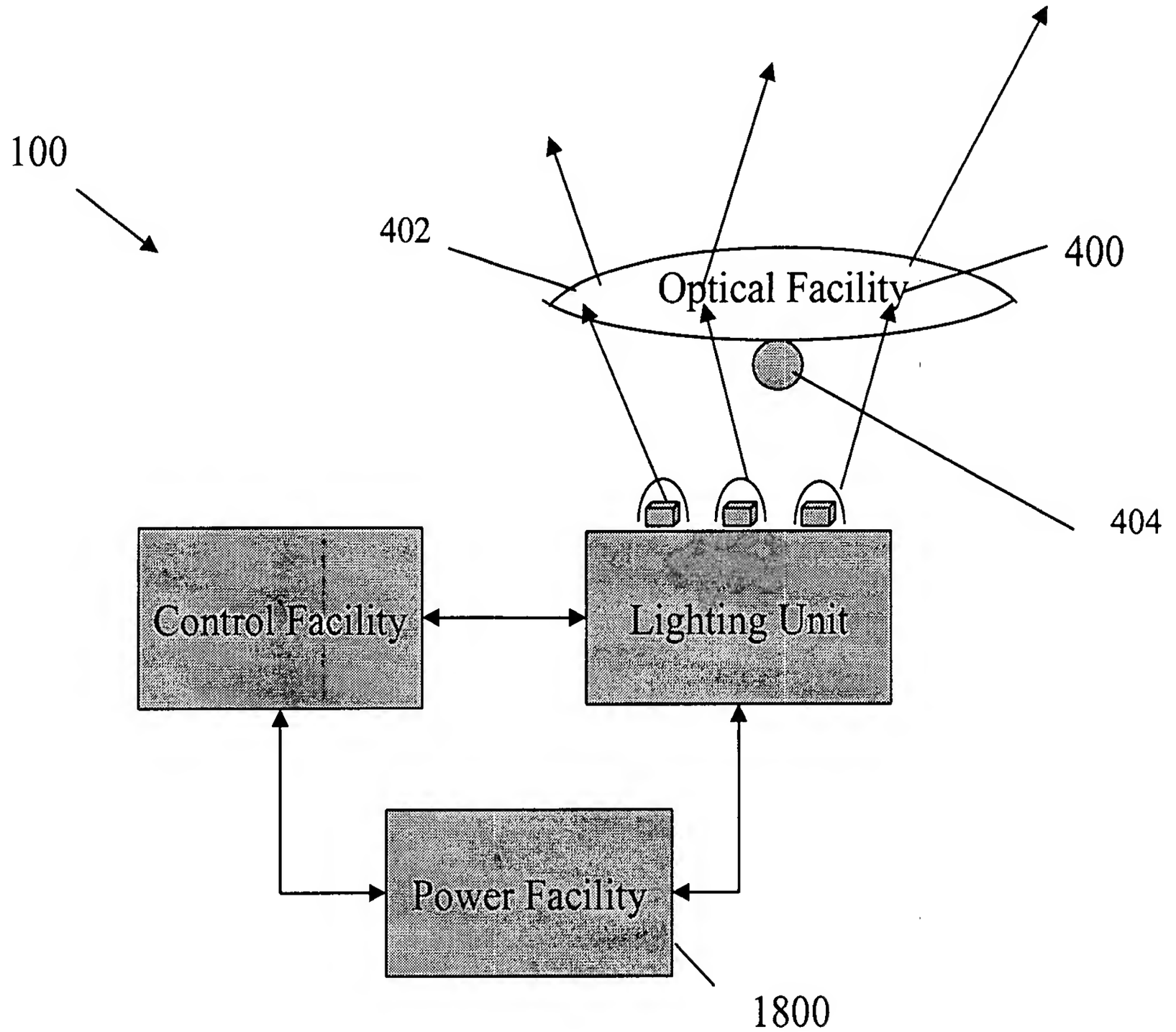

100
402
Optical Facility
400
404
Control Facility
Lighting Unit
Power Facility
1800

Fig. 4

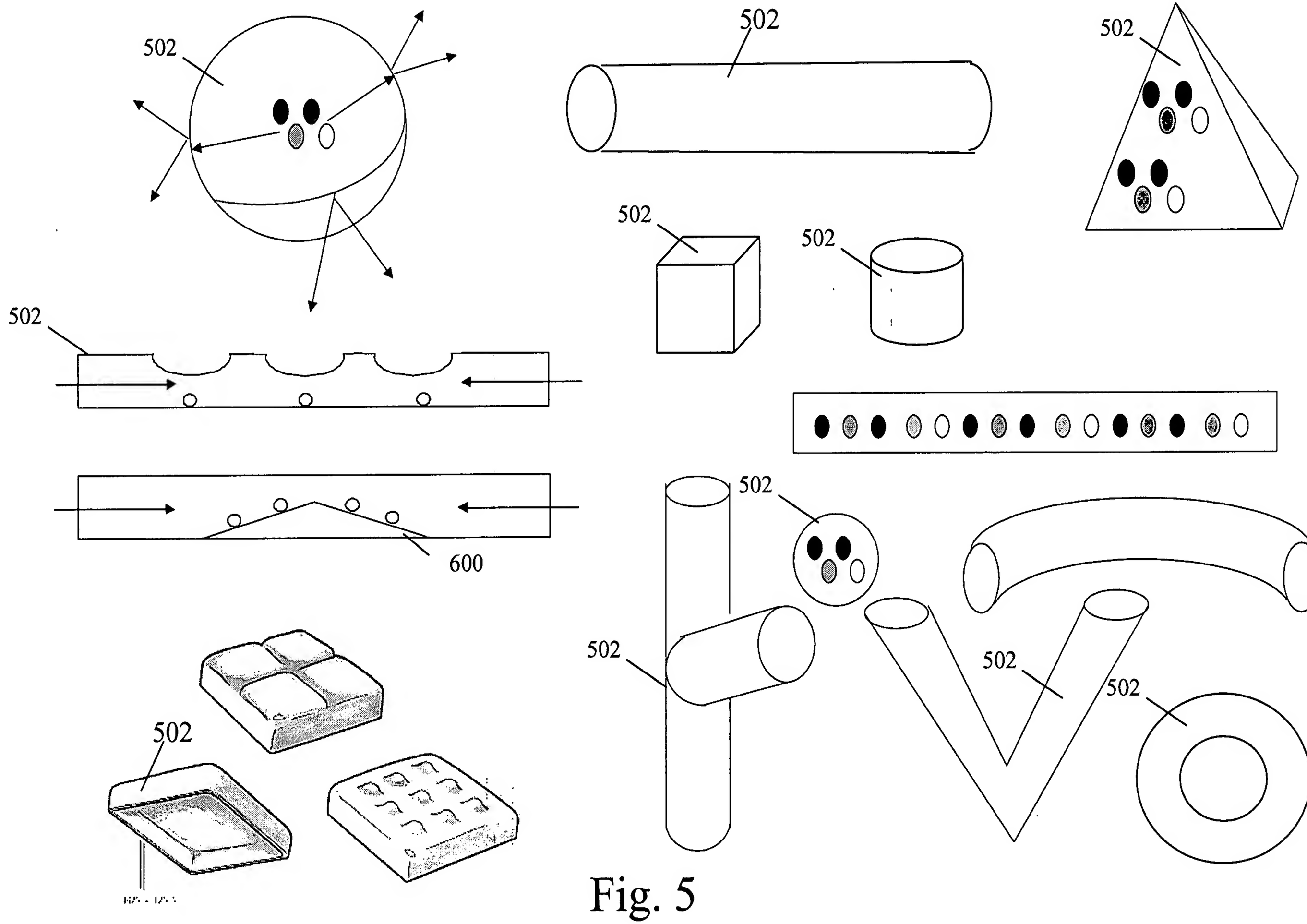
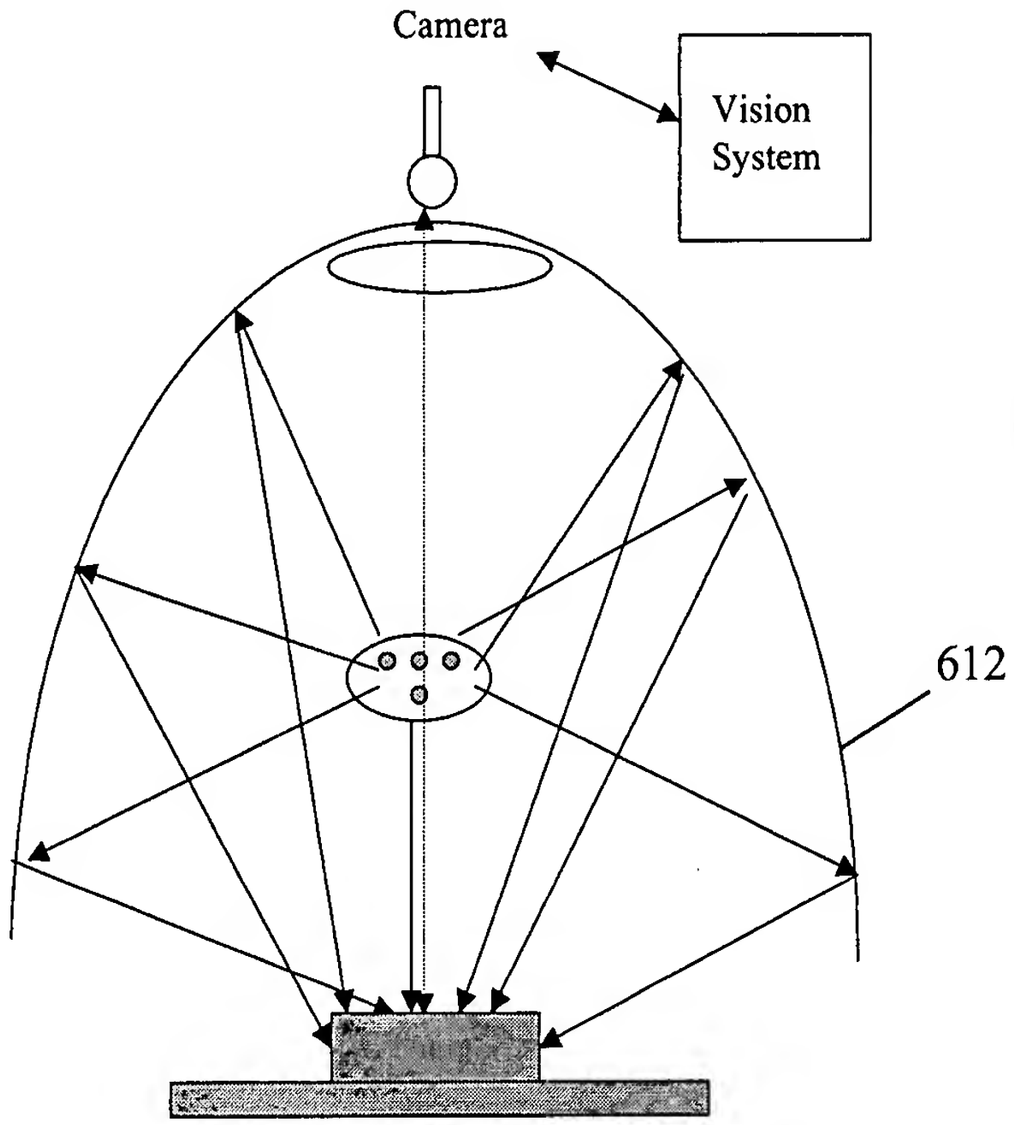
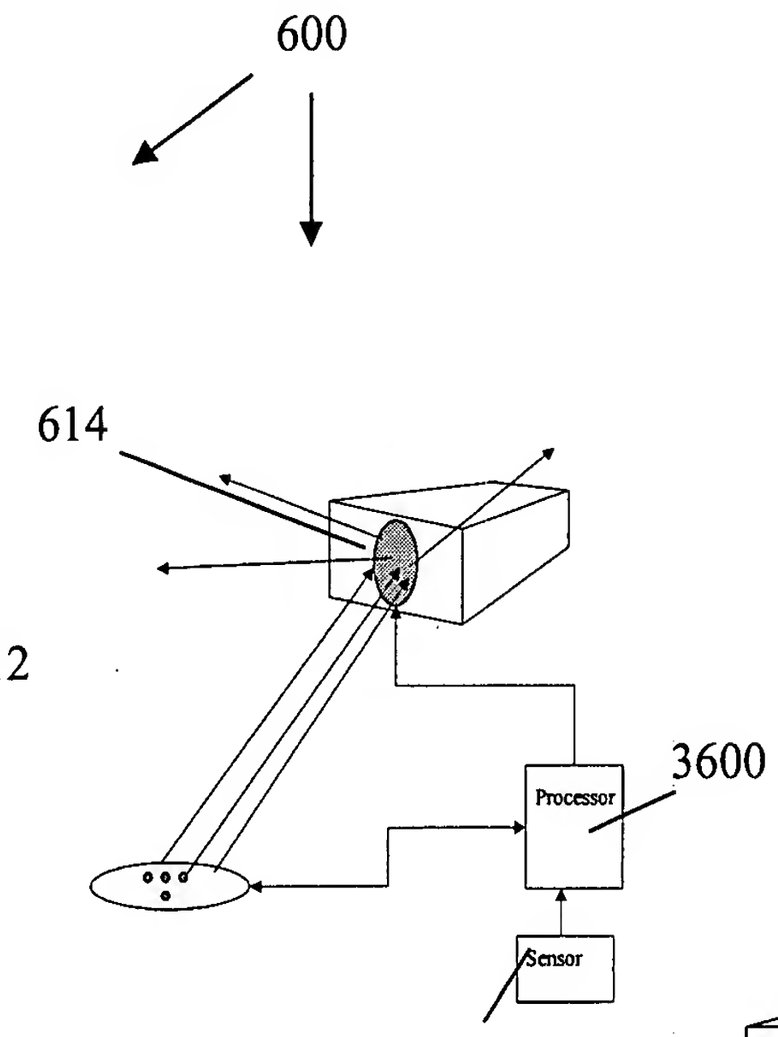
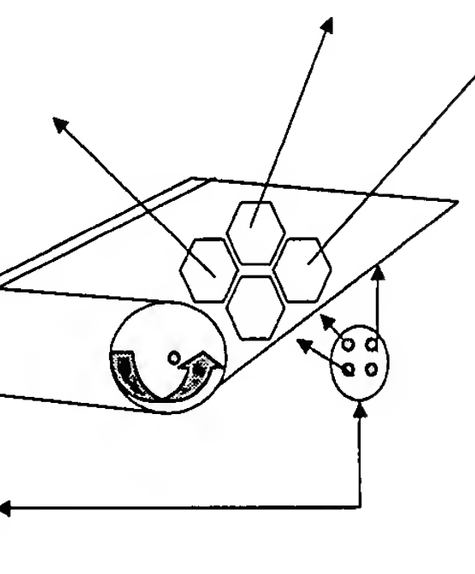
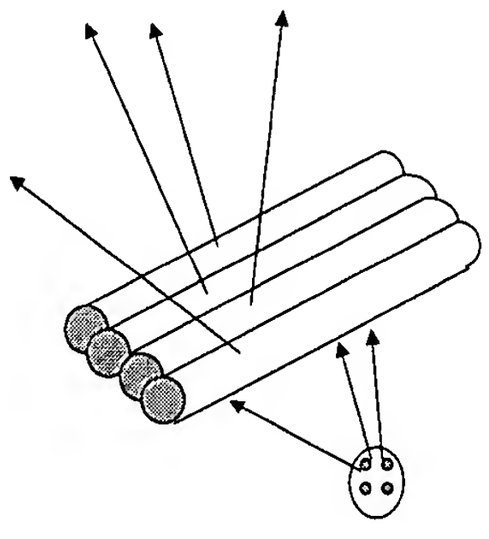


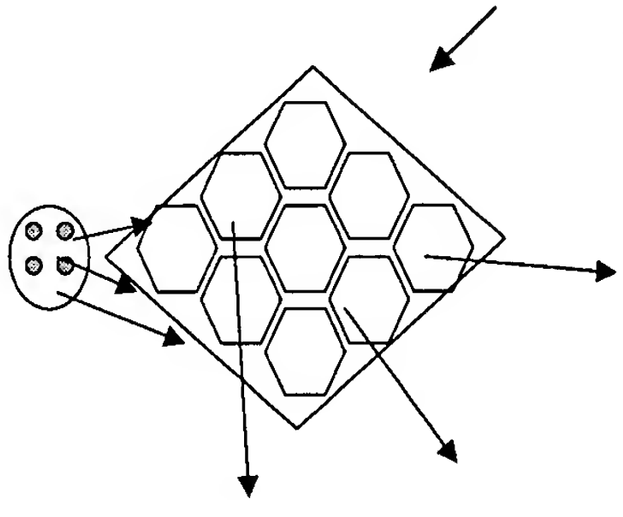
Fig. 5

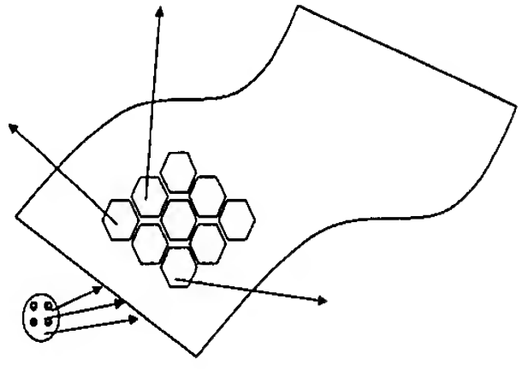

Camera
Vision System
612


600
614
Processor
3600
Sensor
8400


Controller







424

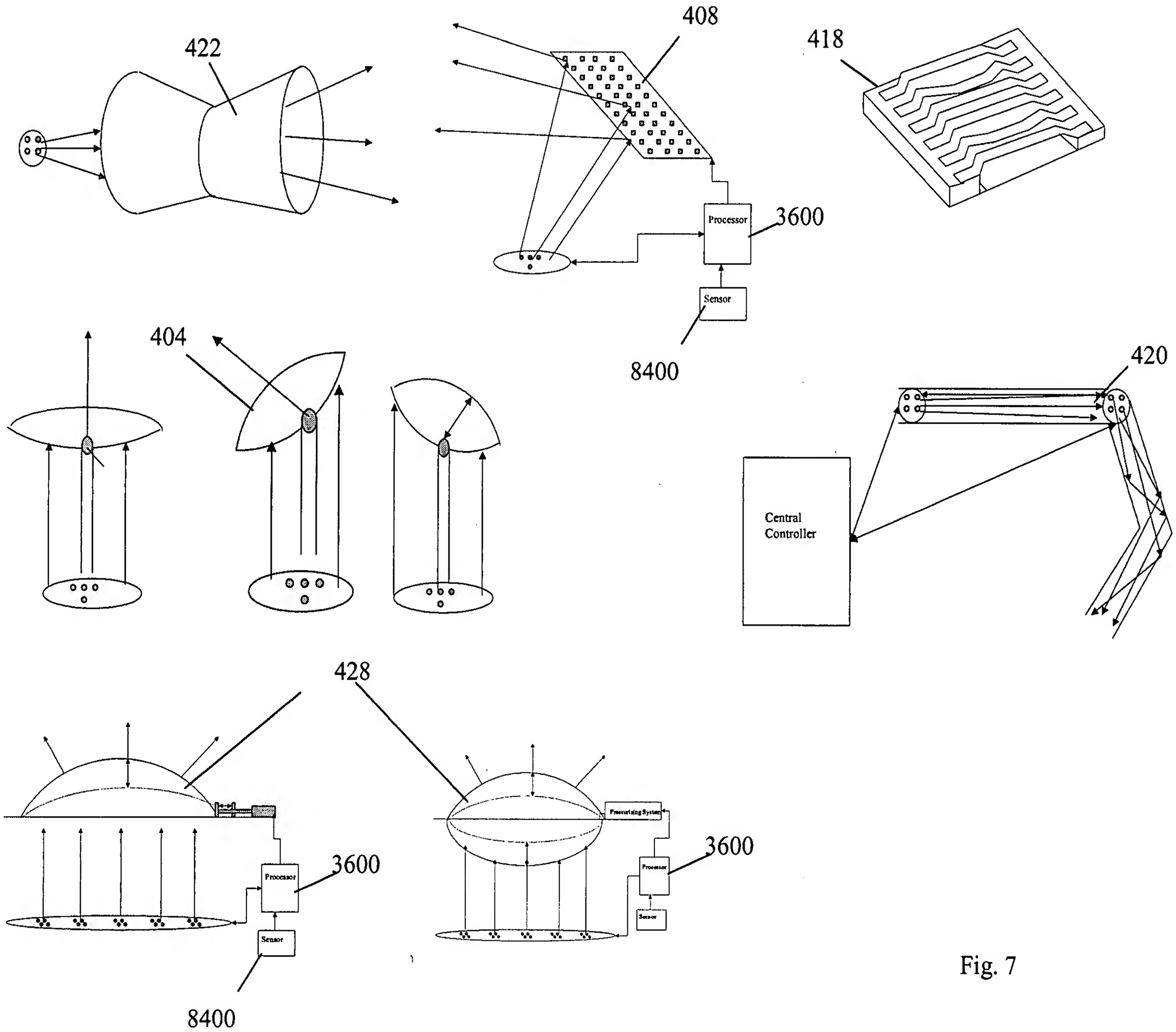

422
408
418
Processor
3600
Sensor
8400
404
420
Central
Controller
428
Processor
3600
Sensor
8400
Pressurizing System
Processor
3600
Sensor

Fig. 7

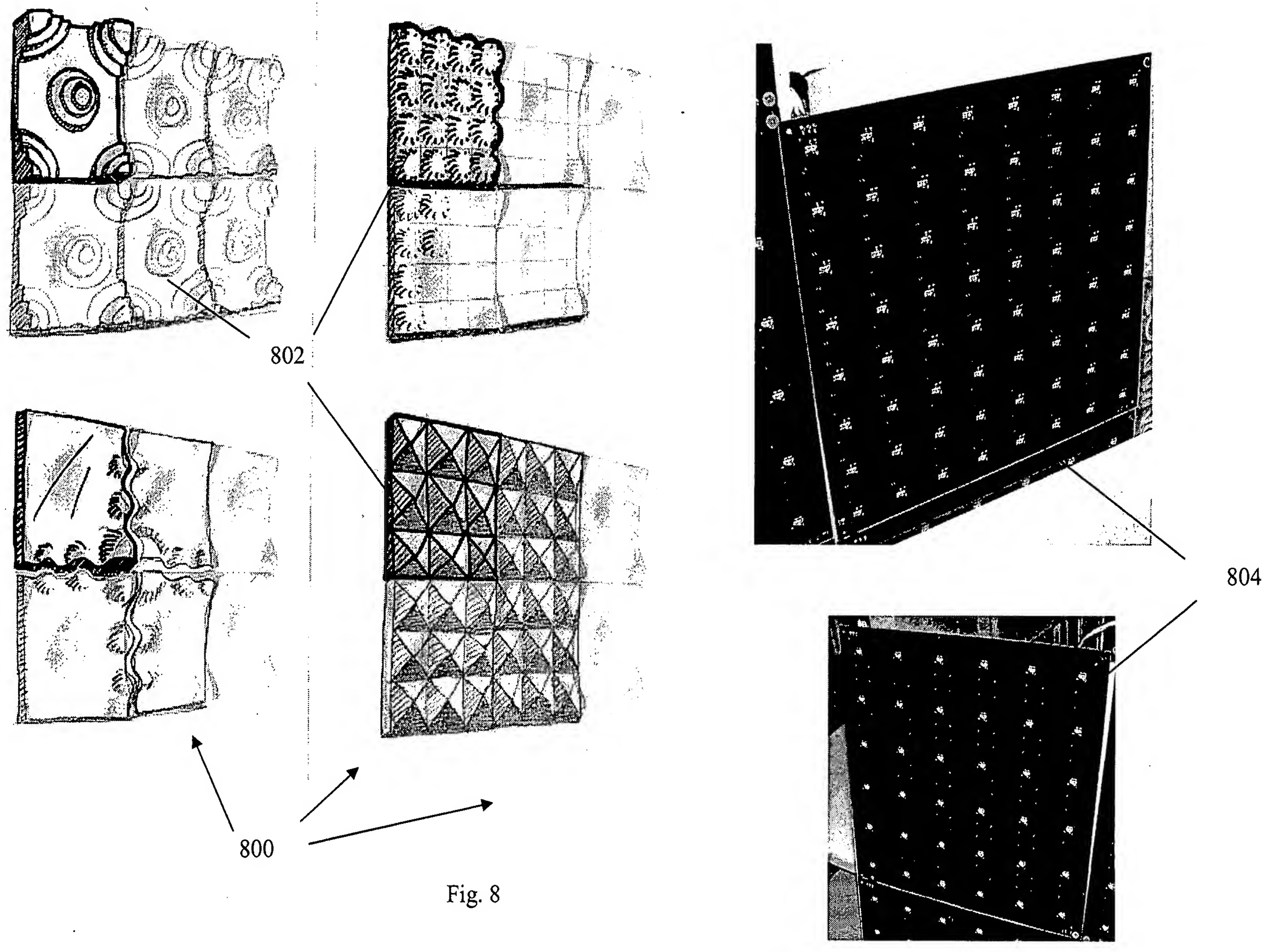


Fig. 8

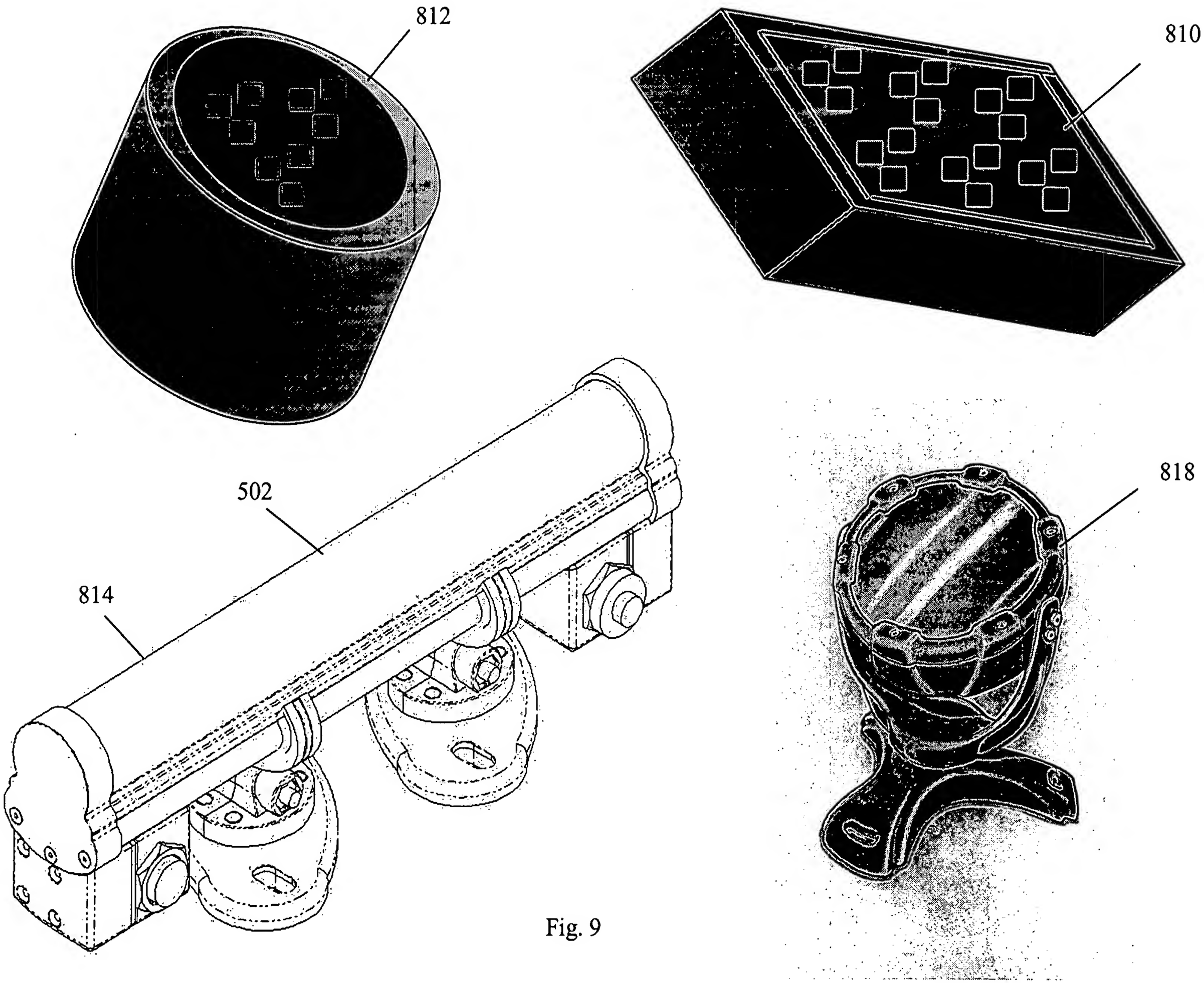


Fig. 9

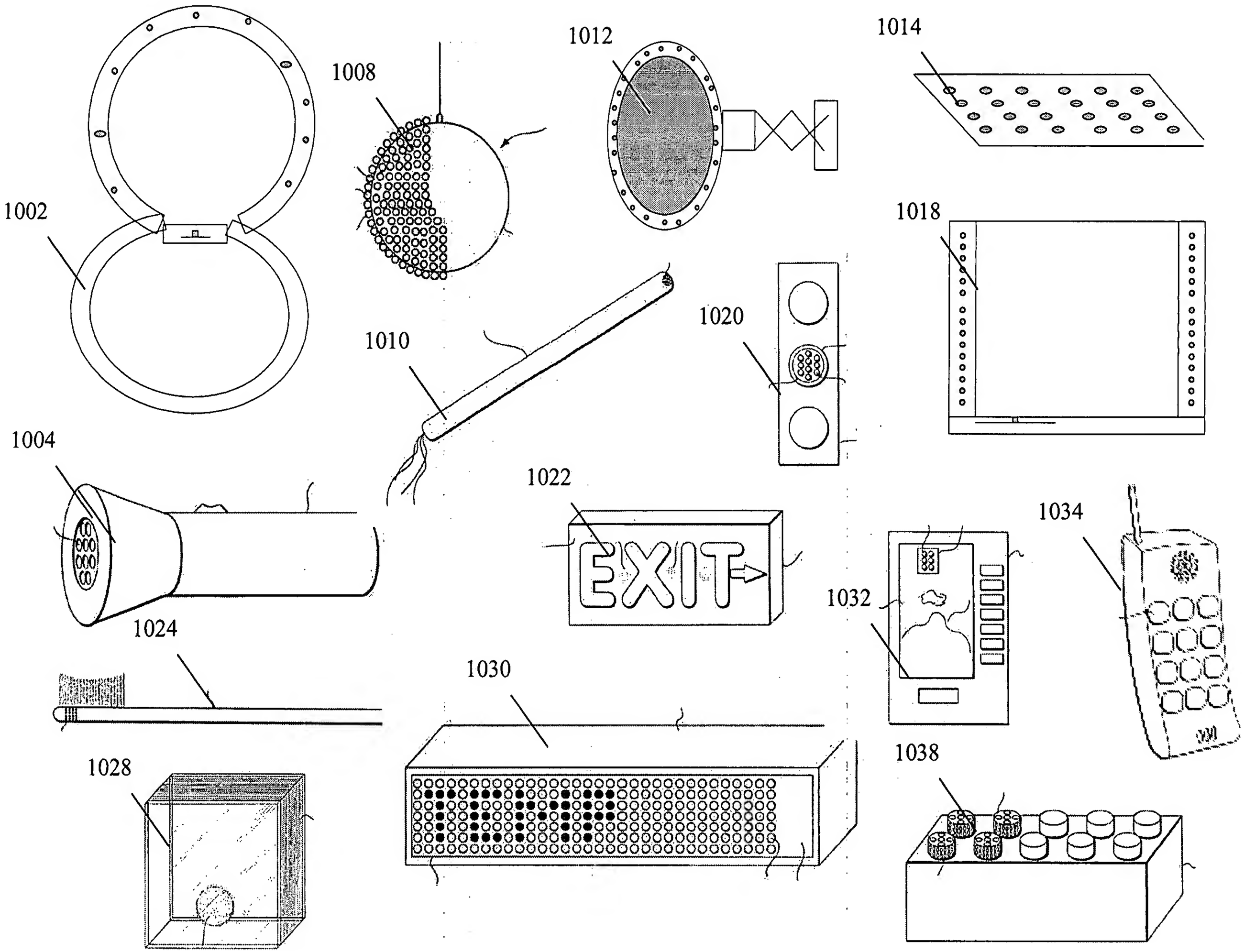

1002
1004
1008
1010
1012
1014
1018
1020
1022
EXIT
1024
1028
1030
1032
1034
1038

Fig. 10